

Olympus 201 SeriesSection 12Airborne Auxiliary Power Plant1. Introduction

The power plant is a small gas turbine driving an alternator. It fulfills two primary functions viz. (i) to provide sufficient electrical power for continued use of essential flight services and (ii) ~~to provide a supply of compressed air for starting either No. 3 or No. 4 engine~~. It can also be used during Ground servicing for independent supplies of electrical power or low pressure air.

2. Description.

The engine consists of a single sided centrifugal compressor driven by a single stage axial turbine and mounted on two bearings. Air is admitted from the underside of the power plant through side intakes to the rotor and passed into the single reverse flow combustion chamber. The gases pass down through a volute to a fixed nozzle ring onto the turbine rotor. The gases are then exhausted to atmosphere. A self-contained fuel control unit provides automatic control for starting, running speed and maximum temperature. As the engine is operated at a constant speed, no throttle valve is necessary, the fuel flow being controlled automatically by spill valves in the air/fuel ratio control unit, the Governor and the temperature control. Lubrication from a Gear type pressure pump draws the air from a $4\frac{1}{2}$ pint oil pump. An electrical heater in the sump will assist starting at altitude. Two starting systems are provided, an electrical starter for normal conditions and a cartridge starter for emergency conditions. There are two cartridges discharging directly onto the turbine blades. To assist starting at high altitude oxygen enrichment is provided. Two cylinders, a pressure reducing valve, a solenoid operated shut-off valve, a charging valve and a system contents gauge are the components in this system. The main burner is used to deliver the oxygen into the combustion chamber. A single fire bottle and fire detector heads mounted on the chassis endure fire protection.

3. Fuel Tank

A 10 gallon fuel tank is mounted at the rear of the A.A.P.P. installation. Replenishment of the tank can be carried out during flight from a connection with the No. 4 engine fuel supply pipe. The fuel pressure passing anon-return valve enters the transfer valve at the inlet to the fuel tank. A second connection with the main refuelling rail ensures replenishment during a normal refuelling sequence. "High level" and "Low level" float switches are fitted in the tank and operate an indicator on the A.A.P.P. Control Panel.

4. Air Supply

A retractable scoop intake fitted below the installation supplies the A.A.P.P. From the scoop the air is ducted two ways viz. (i) to the engine compressor intake and (ii) to the blower unit. The scoop is operated by a hydraulic jack spring loaded to open. Hydraulic pressure closes the scoop and in flight the scoop is opened either by ejecting the air turbine or by the selection of the Master Switch on the A.A.P.P. control panel.

5. Mounting

Two brackets on the top plate of the A.A.P.P. nacelle engage with lugs on the lateral support beam. Bolts and nuts secure the brackets locking being effected by split pins. Slightly aft off the main attachments is a turnbuckle adjusted steadying strut.

6. Variable Diffuser Vanes & Air Bleed.

The diffuser vanes increase the throat width between each vane so increasing the volume of air flowing when the air-bleed is in operation. The air-bleed valve actuator is connected electrically with the actuator for the diffuser vanes so that the vanes will not move until the air-bleed valve is fully open or closed. A single switch in the cockpit designated the Air Selector Switch and an indicator designated the A.A.P.P. Air-Bleed Indicator give the pilot control of this system.

7. Blower Unit

Produces 450 cu.ft. of air per minute to the alternator and oil cooler by separate flexible ducts. The gearbox, formed by the inner casing has a wet sump oil system the capacity being .12 pints. A combined oil filler and spring loaded breather valve is fitted to the outer casing.

8; Compressor Washing.

Command Modification Vulcan 72 introduces an adaptor to the Compressor Intake Manifold for the fitting the washing equipment as introduced by Command Modification Ground Equipment 86.

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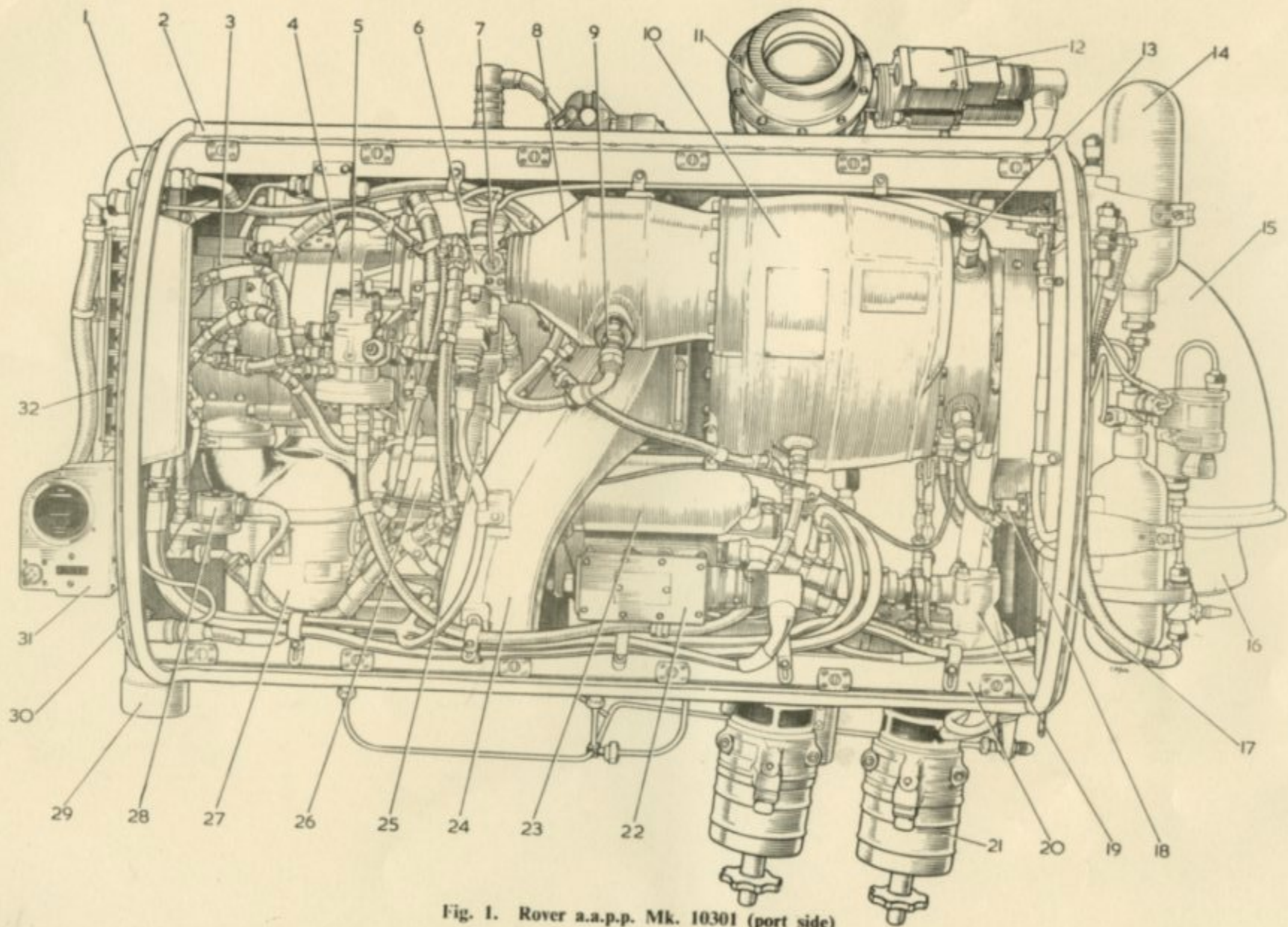


Fig. 1. Rover a.a.p.p. Mk. 10301 (port side)

KEY TO FIG. 1

- | | |
|-----------------------------------|------------------------------|
| 1 FIRE EXTINGUISHER BOTTLE | 17 REAR END PANEL |
| 2 TOP RAIL | 18 FIRE DETECTOR |
| 3 METERING AND PRESSURIZING VALVE | 19 PRESSURE RE-OIL VALVE |
| 4 A.C. GENERATOR | 20 BOTTOM RAIL |
| 5 AIR/FUEL RATIO CONTROL | 21 CARTRIDGE BARREL |
| 6 BURNER | 22 SUMP HEATER |
| 7 OXYGEN ENRICHMENT INLET | 23 OIL FILTER |
| 8 COMBUSTION CHAMBER | 24 AIR INTAKE DUCT |
| 9 IGNITER CONNECTION | 25 BURNER ACTUATOR |
| 10 MAIN AIR CASING | 26 FUEL PUMP GOVERNOR |
| 11 AIR BLEED VALVE | 27 PLANAIR BLOWER |
| 12 AIR BLEED VALVE ACTUATOR | 28 FUEL PRESSURE TRANSMITTER |
| 13 EXHAUST PIPE THERMOCOUPLE | 29 FUEL FILTER |
| 14 OXYGEN ENRICHMENT BOTTLES | 30 FRONT END PANEL |
| 15 JET PIPE SHROUD | 31 HOURS AND STARTS COUNTERS |
| 16 JET PIPE | 32 TERMINAL BLOCK |

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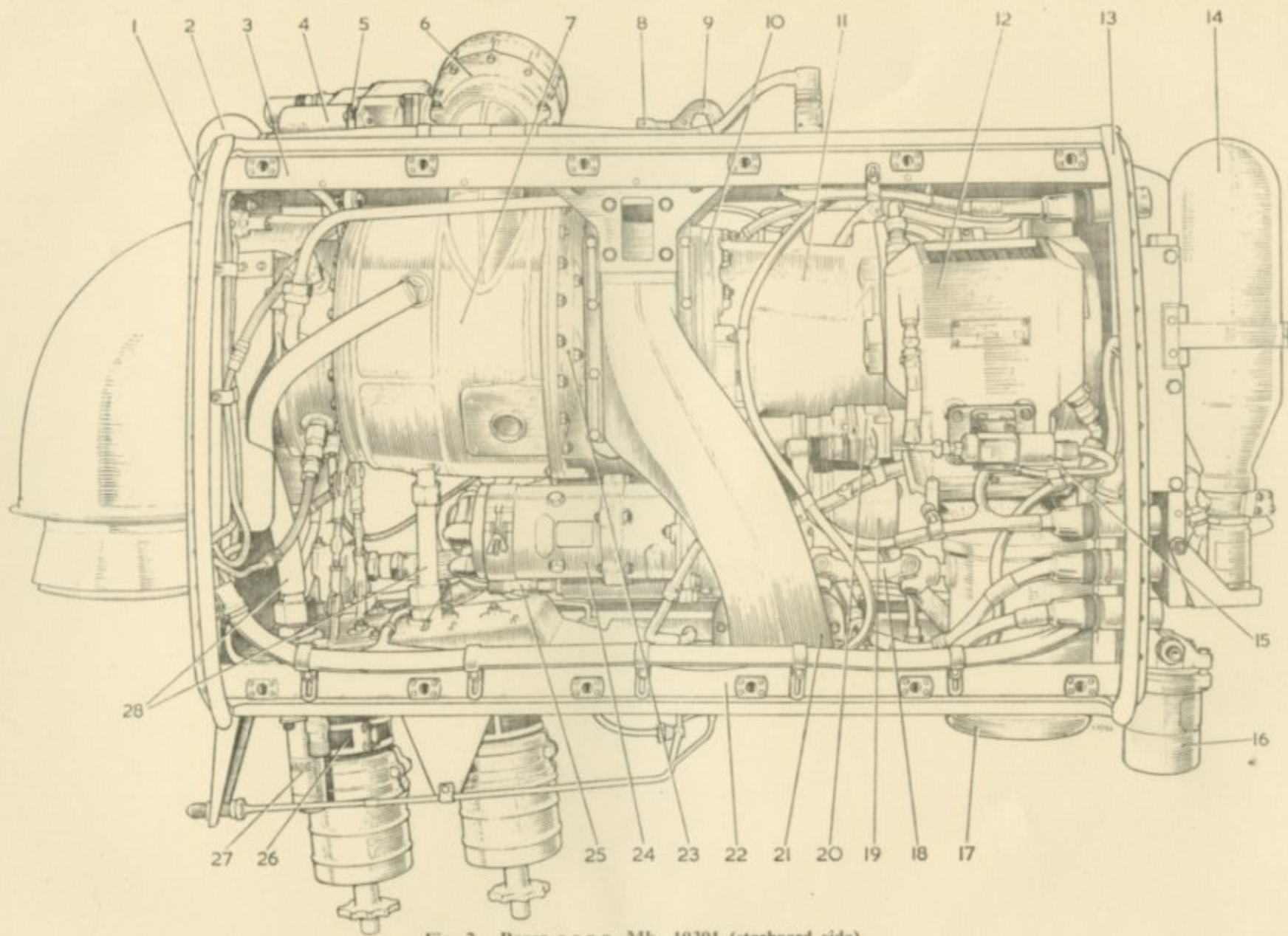


Fig. 2. Rover a.a.p. Mk. 10301 (starboard side)

KEY TO FIG. 2

- | | |
|----------------------------------|-------------------------------------|
| 1 OXYGEN ENRICHMENT BOTTLES | 15 OIL PRESSURE TRANSMITTER |
| 2 REAR END PANEL | 16 FUEL FILTER |
| 3 TOP RAIL | 17 PLANNAIR BLOWER INTAKE |
| 4 AIR BLEED ACTUATOR | 18 BLOWER DRIVE SHAFT |
| 5 THIRD POINT MOUNTING | 19 OIL COOLER ACTUATOR |
| 6 AIR BLEED VALVE | 20 FUEL PUMP GOVERNOR |
| 7 MAIN AIR CASING | 21 AIR INTAKE DUCT |
| 8 ENGINE UNIT MOUNTING | 22 BOTTOM RAIL |
| 9 LIFTING EYE | 23 STARTER MOTOR |
| 10 AUXILIARIES MOUNTING PLATE | 24 COMPRESSOR HOUSING |
| 11 A.C. GENERATOR SUPPORT CASING | 25 SUMP TEMPERATURE BULB CONNECTION |
| 12 OIL COOLER | 26 CARTRIDGE HEATER MAT |
| 13 FRONT END PANEL | 27 CARTRIDGE EXHAUST RELIEF VALVE |
| 14 FIRE EXTINGUISHER BOTTLE | 28 CARTRIDGE GAS INLET PIPES |

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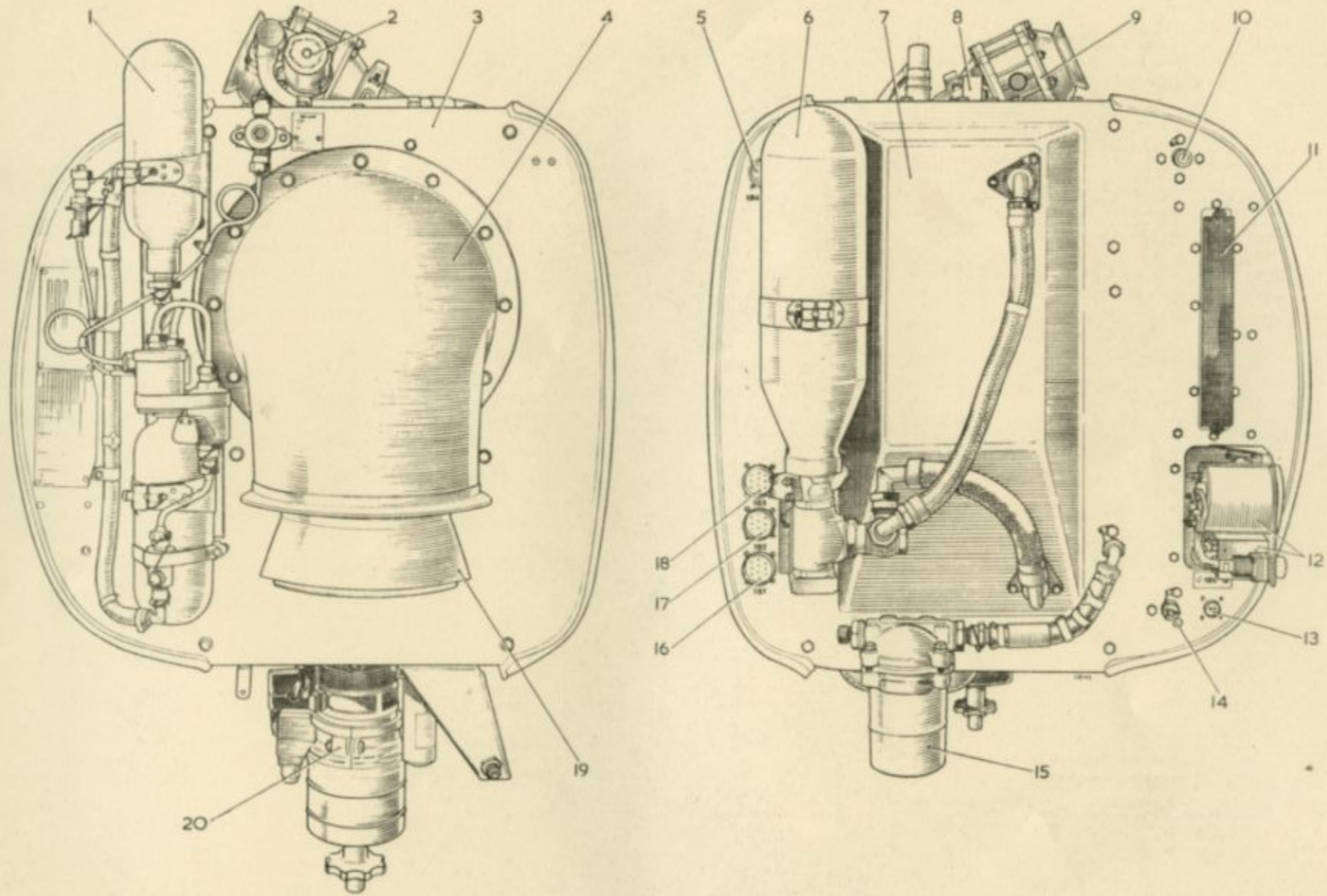


Fig. 3. Rover a.a.p. Mk. 10301 (end views)

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KEY TO FIG. 3

- | | |
|-------------------------------------|--------------------------------------|
| 1 OXYGEN ENRICHMENT BOTTLES | 11 TERMINAL BLOCK |
| 2 AIR BLEED ACTUATOR | 12 HOURS AND STARTS COUNTERS |
| 3 REAR END PANEL | 13 BULKHEAD PLUG—1.B.5. |
| 4 JET PIPE SHROUD | 14 BULKHEAD UNION—COMPRESSOR WASHING |
| 5 BULKHEAD PLUG—1.B.4. | 15 FUEL FILTER |
| 6 FIRE EXTINGUISHER BOTTLE | 16 BULKHEAD PLUG—1.B.1. |
| 7 FRONT END PANEL | 17 BULKHEAD PLUG—1.B.2. |
| 8 LIFTING EYE | 18 BULKHEAD PLUG—1.B.3. |
| 9 AIR BLEED VALVE | 19 JET PIPE |
| 10 BULKHEAD CONNECTOR—IGNITION LEAD | 20 CARTRIDGE BARREL |

Compressor Washing Instructions with Med. 76

To improve the efficiency of the compressor washing operation an injector nozzle has been fitted in the A.A.P.U. compressor housing and piped to the forward bulkhead.

The compressor washing technique to be employed is as follows and must only be carried out when engine is cold i.e. not less than 1 hour after running.

1. Any intake filter must be removed.
2. Remove breach caps and dummy cartridges.
3. Disconnect A.F.R. compressor delivery pipe at compressor casing.
4. Fit blanking plug to compressor casing.
5. Remove drain valve.
6. Fit suitable length of piping to act as drain.
7. Remove blank from forward bulkhead union.
8. Charge fluid container stores Ref 4G/5358 with 3 pints water, $\frac{1}{2}$ pint Turbex (SG.25), 3 pints of aviation kerosene in that order.
9. Mix by shaking the container thoroughly.
10. Pump up pressure in fluid container to 30 P.S.I.
11. Connect fluid container pipe to bulkhead union.
12. Set H.P. cock to 'closed'.
13. With N.C.O. motoring engine for period of 30 secs, operate spraying until the engine has stopped turning. The cooling blower shaft will indicate this.
14. Empty the fluid container and refill with 6 pints distilled water pump up to 30 P.S.I.
15. At not less than 15 mins. after operation 13 repeat operation 13 using distilled water.
16. Empty fluid container and refill with 6 pints of distilled water, pump to 30 P.S.I.
17. Repeat operation 13 with distilled water and allow sufficient time for water that has accumulated to drain away (5 mins).
18. Disconnect the fluid container pipe from the bulkhead unions.
19. Remove drain pipe.
20. Replace drain valve and lock with wire.
21. Remove main casing blanking plug.
22. Reconnect A.F.R. compressor pipe and lock with wire.
23. Replace the blank on the forward bulkhead union.
24. Wipe away all surplus fluid.
25. Replace cartridge dummies and breach caps.

Washing Times

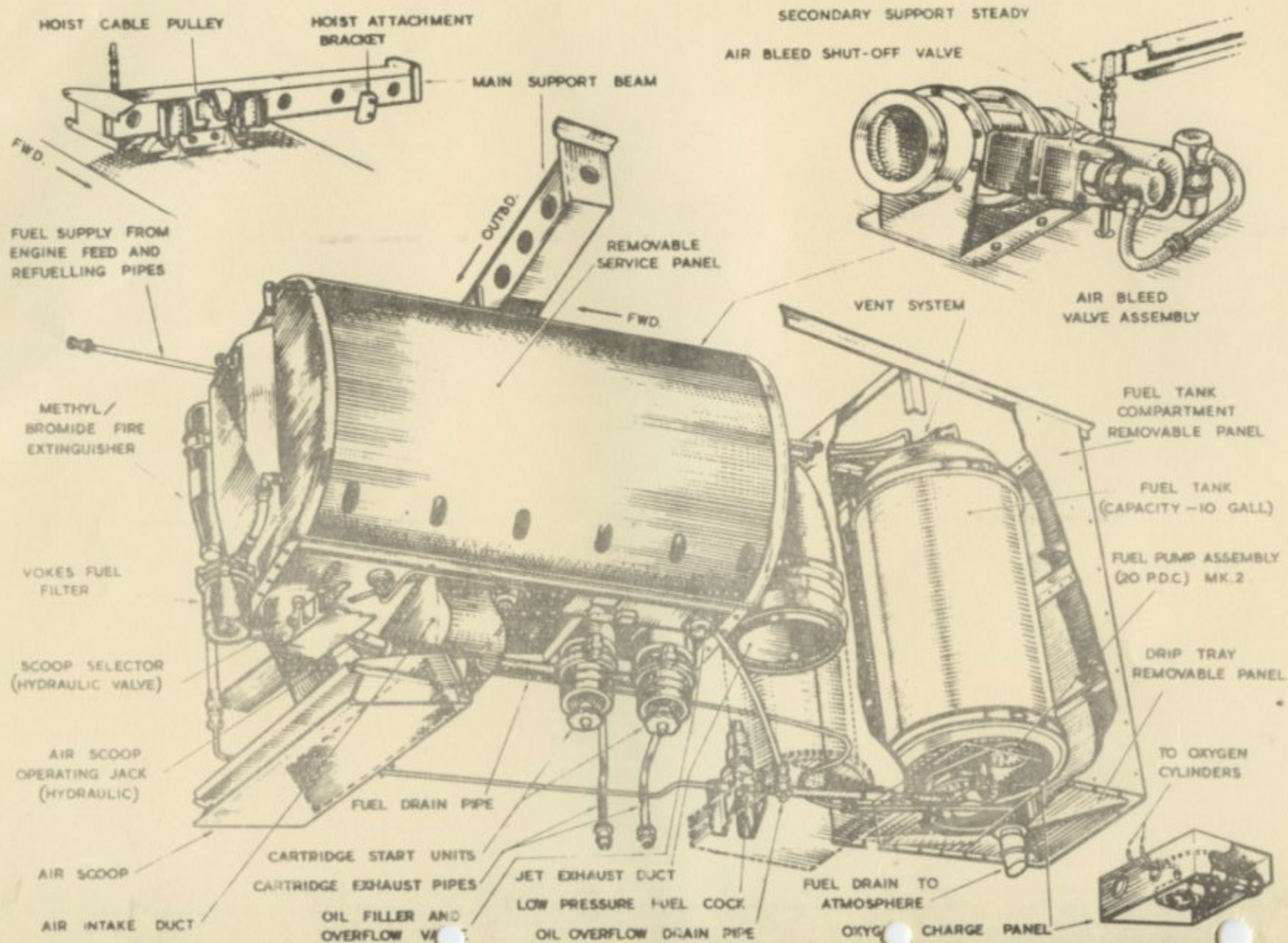
10 A.A.P.U. running hours or
50 Flying hours whichever the soonest.

Also:- after each cartridge start.

Reason for Washing

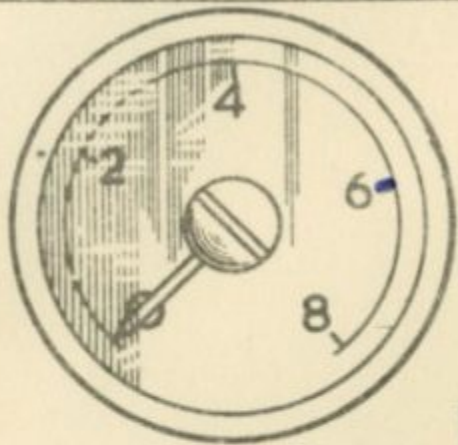
- (i) If deterioration in performance and power output is experienced in service due to fouling of compressor and diffusers by exhaust gases and deposits from cartridge starting.
- (ii) Also if allowed to accumulate, this contamination hardens and becomes baked in position requiring stripping of the unit to remove it at comparatively short periods of time.

ROVER A.A.P.P. INSTALLATION



A.A.P.P.

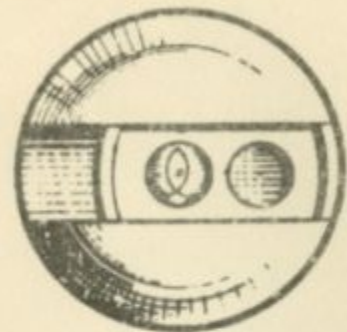
JET PIPE TEMPERATURE



OIL PRESSURE



FUEL LEVEL



START
DO NOT ATTEMPT
CARTRIDGE RESTART
UNTIL LIGHT IS OUT

BOOSTER PUMP

SCOPE

FIRE



FIRE TEST



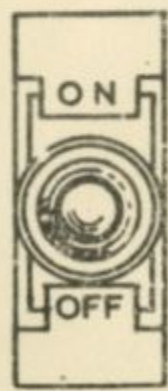
LP COCK



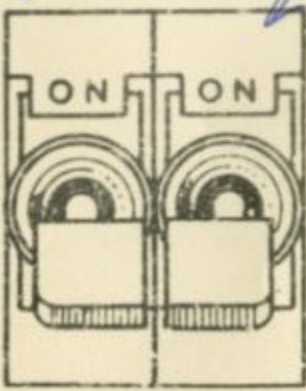
HP COCK
OVERRIDE



IGN
ISOL



OXYGEN
REGULATOR



MASTER
SWITCH

PANEL TOP

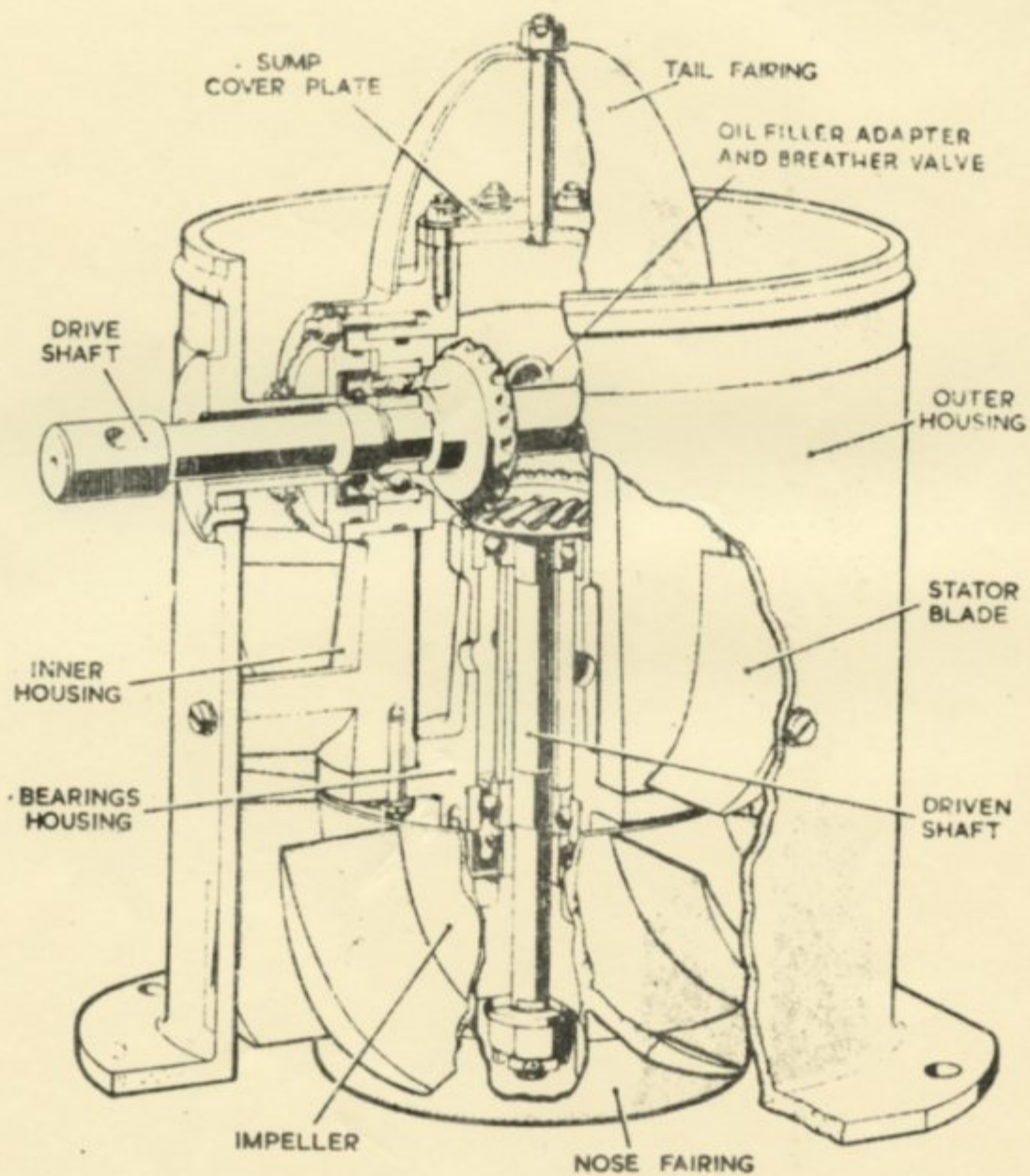


Fig. 6. Blower unit



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R-Type Mk2
pressure breathing
mask

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